APPLICATION

FOR

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FOR

RAPID DEPLOYMENT OF TROOPS AND CARGO

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RAPID DEPLOYMENT OF TROOPS AND CARGO

BACKGROUND OF THE INVENTION

This application claims the benefit of U.S. provisional Application No. 60/238,464 filed October 10, 2000.

Rapid deployments of troops and cargo are required in emergency conditions such as fires or flood, in rescue operations, in anti-terrorist operations and in combat operations.

Rapid deployment of troops and cargo may be accomplished by low flying planes which rapidly push cargo sleds with parachutes from rearward-facing loading ramps and which deploy troops with parachutes. Parachute descents or cargo and troops are vulnerable to high winds, hostile fire and forest canopies. Air drop operations are particularly difficult in places that have limited reception areas. Rapid descents by cables from hovering helicopters have been used, but the descents may be relatively slow and require special gear worn by the troops.

Needs exist for improved high speed cargo and troop insertion systems.

SUMMARY OF THE INVENTION

The present invention meets the requirements of rapid deployment by providing rapid safe egress from heavy-lift helicopters and tilt-rotor aircraft. The invention provides an alternative to sled cargo drops.

The tubes of the present invention are particularly useful in emergency cargo and special insertion operations.

The tubes of the present invention provide cargo delivery and troop insertions for high wind states, in limited reception areas, in forest canopies and under hostile fire.

The new invention uses tubes which are about thirty meters in length and one and one-half meters in diameter, delivers cargo and place troops on the ground ready to enter combat environments. Troops emerge standing up with weapons ready and with armor protection at the rear of the troops at the moment of insertion.

Preferred embodiments of the invention use stiffener extruding spines which act as both power ramp and stiffening structure which are extendable hydraulically or pneumatically. Kevlar exteriors on frontal segments of the tubes provide armor protection against hostile fire during descent and upon troop emergence. The present invention uses the retarder systems described in United States Patent 5,620,058, the disclosure of which is incorporated herein in its entirety by reference.

The Life Step interior mechanisms described in that patent are used herein.

The present invention uses a retractor mechanism attached to the stiffener extruding spine. After use, the invention may drop the tube and recover the spine and Kevlar shield or recover the entire tube. The invention is provided in a self-contained package which bolts to cargo ramps and internal storage attachments in heavy-lift helicopters or tilt-rotor aircraft. The whole package weighs between about 500 and 1000 pounds. The

tubes use a system for inflation of the retarders within the tube similar to automotive airbag inflation, without the rapid deflation features of automotive airbags. Smocks may be provided to troops for use during the sliding through the descent tubes to reduce snags.

Pockets are provided on exteriors of the tubes to hold and allow the deployment of inflated winglets, which provide addition stability at operational speeds.

A preferred stiffener extruding spine telescopes and has about fifteen or more tubes of decreasing diameters in approximately two meter lengths. The tubes operate basically as sliding pistons and are deployed with hydraulic or gas extension. Powered rollers and belts contact outsides of sequential tube sections to recover the tube and to telescope and drive the sections into the storage container upon recovery after deployment.

These and further and other objects and features of the invention are apparent in the disclosure, which includes the above and ongoing written specification, with the claims and the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic representation showing deployment of troops in rapid safe egress from tilt-rotor aircraft.

Figure 2 is a schematic representation of deployment of cargo or troops from a heavy-lift helicopter.

Figure 3 is a schematic representation of releasing a cargo dropping and troop-descending tube after egress of troops and depositing of cargo.

Figure 4 is a schematic representation of deployment of troops from a heavy-lift helicopter.

Figure 5 is a schematic representation of use of the invention with a fixed wing aircraft for emergency cargo and special troop insertion operations.

Figure 6 is a schematic representation of troop insertion using a tilt-rotor aircraft.

Figure 7 is a schematic detail of a lower section of the insertion system shown in Figure 6.

Figure 8 is a cross-section of the preferred insertion system.

Figure 9 is a schematic representation of a landing system showing belts and rollers used for retraction.

Figure 10 shows telescoping of sections of the landing system.

Figure 11 schematically represents a telescoping spine of the new landing systems.

Figures 12 and 13 are plan and elevational views of tilt-rotor aircraft suitable for use with present invention.

Figure 14 shows a tilt-rotor aircraft before chute deployment.

Figure 15 shows the aircraft after instantaneous deployment of dual tubes for soft landing of troops or cargo.

Figures 16 and 17 schematically represent the use of chutes for cargo and troop insertion from heavy-lift helicopters.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figure 1, tilt-rotor aircraft 1 is provided with a landing tube 10 of the present invention. Troops 11 exit the tilt-rotor aircraft 1 through tube 10. Flexible retarders 13 within the tube 10 retard the gravitational descent of the troops which leave the aircraft ready for the combat action.

As shown in Figure 2, a heavy-lift helicopter employs a tube 10 with retarders 13 for dropping cargo 17 which falls under the influence of gravity through the tube 10, impacting and deforming the soft retarders 13. The undamaged cargo 17 exits the bottom of the tube.

As shown in Figure 3, tube 10 may be released from the helicopter 15 after the completion of the cargo drop or troop deployment. Alternatively, the tube may be mechanically raised back into the helicopter 15.

As shown in Figure 4, the gravity retarder tube 10 may be affixed to a cargo opening 19 of a heavy-lift helicopter 15. Troops 11 jump into the descent-retarding tube 10 and exit the bottom 21 of the tube in combat-ready condition.

Figure 5 shows the use of the gravitational retarding tube 10 on a fixed wing aircraft 23 to deposit cargo 17 or troops 11 on the ground 25 during a low level, low speed flight. Cargo alone may be dropped at a higher speed.

The invention provides rapid safe egress from heavy-lift helicopters and tilt-rotor aircraft for cargo use. The invention provides an alternative to sled cargo drops. When dropped using the present invention, cargo is ready to use without releasing cargo from the heavy sleds. The entire payload may be used for cargo rather than for the buffering and packaging equipment which is discarded. The avoidance of sleds and straps reduces and eliminates waste and trash and reduces critical time of unpacking the cargo for distribution and use.

The invention is particularly useful for emergency cargo drops and special troop insertion operations.

Figure 6 shows a tilt-rotor aircraft 1 moving slowly forward and dragging a descent tube 31 at an angle.

The tube 31 uses the retardation technology described in detail in United States Patent 5,620,058, the entirety of which is incorporated herein by reference. The troops 11 hit a cushion or inflatable ramp 27 connected to the bottom of the tube 10.

The present invention as shown in Figure 6, is preferred for use in troop insertions and is usable in high wind states in limited reception areas with forest canopies and under hostile fire.

Using the present invention, it is possible for troops to enter combat environments standing up with weapons ready while having armor protection at their rear at the moment of insertion.

Figure 7 shows a detail of the tube 31 shown in Figure 6. Preferably the tube 31 has a stiffener extruding spine 35 which

is inflated to rigidity. A Kevlar exterior armor section 37 is provided on the front portion 39 of the tube 31. The rear section 41 of the tube may be left without the Kevlar armor protection. The Kevlar armor protection may surround the tube.

The bottom of the stiffener extruding spine 35 is provided with a flexible hinge 43 to which the inflated ramp 33 is connected.

In a preferred embodiment, the inflated ramp has front and rear sections 45 and 47 which are interconnected 49 to provide flexibility when landing in rough terrain.

The telescoping spine and Kevlar shield are recoverable. Alternatively, the entire tube is recoverable. The whole package weighs between about 500 pounds and 1000 pounds. The entire package uses standard Life Step inflation of retarders as described in United States Patent 5,620,058. Inflation is similar to automobile airbag inflation by the gaseous products of rapidly combustible chemicals without the deflation associated with airbags. When the entire tube is recovered plugs are pulled, preferably automatically, to release gas pressure from the internal retarders and the deployed winglets as the tube is recovered. Alternatively, the tube may be dropped from the aircraft and recovered from the ground after the operation is secured.

In one embodiment, troops are provided with slide smocks to reduce possibility of snags during descent. The troops may pull on the slide smocks prior to jumping into the tube.

Alternatively, the slide smocks are held open within the tube and the personnel jump into the slide smock. The slide smock is made of friction reducing material, at least on the inside and the entire slide smock drops from the jumper stands up at the bottom of the tube.

Figure 8 shows a cross-section of a preferred tube with a stiffener extruding spine 35 shown inside the Kevlar armored coating 37. Inflatable stabilizing winglets 61 are added at exterior sides of tube 41 to provide stability during deployment at speeds.

Figures 9, 10 and 11 show stiffener extruding spines telescoped. The spines are held in a storage container 63 which is attached to the aircraft. Retraction is provided via powered rollers 65 which engage outer surfaces of the spine sections. Spine sections 67 are telescoped as shown in Figures 10 and 11.

Figure 9 shows the deflated life step tube 41 which is packaged for release. Upon release of the tube 41, the spine sections 67 slide into the tube or into a long tube within the tube by gravity, by driving in an outward direction by the powered rollers and belt system 65 or preferably by internal pneumatic or hydraulic pressure. The pneumatic pressure may be supplied by rapidly combusting gases as in the case of automotive airbag deployments.

In one preferred embodiment, the stiffener extruding spine has about fifteen segments decreasing in diameter. Each segment is about two meters in length. The structure is basically

telescoping pistons which are driven by conventional hydraulic or air pump or air extension systems or by rapidly expanding gas generation systems.

Preferably, the tube is a round tube about one and a half meters in diameter. The tube may have shaped cross-sections of any shape, such as but not limited to, round, ovoid, etc. The Kevlar coating 37 covers the forward side of the tube. The stiffener extruding spine slides within a small tube at the front of the larger tube 41. Preferred tilt-rotor aircraft used with the present invention as shown in Figures 12 and 13. The plane is operated by a crew of two and carries twenty-four troops with a fourteen ton troop and cargo capacity, for example. The aircraft is operable with one rotor.

Figure 14 schematically shows the preferred tilt-rotor aircraft 1 flying at slow speed or hovering. Figure 15 shows rapid deployment of troops 11 through two retarder tubes 10.

Figure 16 shows a heavy-lift helicopter 15 deploying troops 11 through a different descent retarding tube 41.

Figure 17 shows a heavy lift helicopter 15 deploying troops through a gravity descent retarding tube 10.

While the invention has been described with reference to specific embodiments, modifications and variations of the invention may be constructed without departing from the scope of the invention, which is defined in the following claims.